

REMARKS

Claims 1-30 are pending. Claims 1-26 are under consideration. Claims 27-30 have been withdrawn from consideration. Claims 1, 10, 14, and 20 are the remaining independent claims under consideration.

As a threshold matter, applicant respectfully requests that the reasons for the rejection of any claim actually be stated so that Applicant may judge the propriety of continuing prosecution. In this regard, both 35 U.S.C. § 132 and 37 C.F.R. § 1.104(2) require that the reasons for any adverse action be stated in an Office action. However, the Office action mailed October 20, 2006 does not set forth any grounds for the rejection of the dependent claims. Moreover, many of the rejections of the independent claims appear to be made without consideration of the subject matter recited in those independent claims. For example, the rejections of claims 1 and 10 under 35 U.S.C. § 102(b) over Chen make no mention the subject matter recited in claims 1 and 10 at all.

Accordingly, the rejections of claims 1-27 are facially deficient as failing to meet the requirements of 35 U.S.C. § 132 and 37 C.F.R. § 1.104(2). Applicant therefore requests that they be withdrawn.

CLAIMS 1 and 14

In the action mailed October 20, 2006, claim 1 was rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,821,014 to Chen et al. (hereinafter "Chen").

Claim 1 relates to a method that includes identifying a pair of features to be printed using a corresponding pair of patterning elements, the pitch of the pair of features being sufficiently small that, upon printing, diffraction will make a separation between the features smaller than a separation between the corresponding pair of patterning elements, and increasing a separation distance between the pair of patterning elements while maintaining the sufficiently small pitch between the corresponding printed features.

As an anticipation rejection, the rejection of claim 1 is understood to contend that Chen describes that a separation distance between a pair of patterning elements is increased while a sufficiently small pitch between corresponding printed features is maintained.

Applicant respectfully disagrees. In this regard, Chen describes that variations in feature dimensions in a lithographic process can be reduced using scattering bars. See, e.g., *Chen*, col. 2, line 34-36. Scattering bars are "typically" non-resolvable correction features that are placed next to

isolated edges on a mask to adjust the edge intensity at the isolated edge. *See, e.g., Chen*, col. 1, line 59-65.

As best understood by Applicant, all of Chen's scattering bars are unresolved. For example, in Chen's "fifth technique," scattering bar width is increased from a nominal width to a "maximum allowable width" but yet remains unresolved. *See, e.g., Chen*, col. 3, line 33-42; col. 9, line 6-14.

Since Chen's scattering bars are unresolved, Chen's manipulation of their width neither describes nor suggests that a separation distance between the pair of patterning elements be increased while a sufficiently small pitch between corresponding printed features is maintained. In particular, Chen's scattering bars cannot constitute either "printed features" or "patterning elements" that are to print features, as recited in claim 1.

Moreover, please note that Chen's "sixth technique" also does not describe or suggest that a separation distance between a pair of patterning elements is increased while a sufficiently small pitch between corresponding printed features is maintained. In Chen's "sixth technique," the placement of adjacent primary feature edges is adjusted. *See, e.g., Chen*, col. 9, line 15-19. In particular, one or more adjacent primary feature edges can be adjusted back to increase separation between adjacent edges. *See, e.g., Chen*, col. 9, line 48-54.

Even if the pitch between Chen's adjacent primary features were "sufficiently small" that, upon printing, diffraction would make a separation between the features smaller than a separation between the corresponding pair of patterning elements (which applicant does not concede), claim 1 would still not be anticipated by Chen. In this regard, Chen explicitly states that "[a]fter [a 0.2 w] trimming [of] the primary feature edges, the feature separation will be 0.4 w wider." See *Chen*, col. 9, line 58-60. Thus, Chen's increase in the separation distance between adjacent primary feature edges *increases* the pitch between the corresponding printed features. This is outside the scope of claim 1, which recites that the sufficiently small pitch between corresponding printed features is maintained while a separation distance between a pair of patterning elements is increased.

Accordingly, claim 1 is not anticipated by Chen. Applicant respectfully requests that the rejections of claim 1, and the claims dependent therefrom, be withdrawn.

Claims 1 and 14 were rejected under 35 U.S.C. § 102(e) as anticipated by U.S. Patent No. 6,964,032 to Liebmann et al. (hereinafter "Liebmann").

Claim 14 relates to an article that includes a machine-readable medium storing instructions operable to cause one or more machines to perform operations. The operations include

identifying a pair of features and increasing a separation distance, as recited in claim 1.

As anticipation rejections, the rejections of claims 1 and 14 are understood to contend that Liebmann describes that a separation distance between a pair of patterning elements is increased while a sufficiently small pitch between corresponding printed features is maintained.

Applicant respectfully disagrees. In this regard, Liebmann describes the implementation of sub-resolution assist features (SRAF) in lithographic masks. *See, e.g., Liebmann*, col. 1, line 6-12. Sub-resolution assist features are non-printing features. *See, e.g., Liebmann*, col. 3, line 2-7.

Since Liebmann's sub-resolution assist features do not print, Liebmann's manipulation of sub-resolution assist features neither describes nor suggests that a separation distance between the pair of patterning elements be increased while a sufficiently small pitch between corresponding printed features is maintained. In particular, Liebmann's sub-resolution assist features cannot constitute either "printed features" or "patterning elements" that are to print features, as recited in claim 1.

Accordingly, claims 1 and 14 are not anticipated by Liebmann. Applicant respectfully requests that the rejections of claims 1, 14, and the claims dependent therefrom, be withdrawn.

Claims 1 and 14 were also rejected under 35 U.S.C. § 103(a) as obvious over Chen and Liebmann. As obviousness rejections, the rejections of claims 1 and 14 are based on the contention that the subject matter recited in claims 1 and 14 would have been obvious to one of ordinary skill in light of Chen and Liebmann.

Applicant respectfully disagrees and instead submits that, even if Chen and Liebmann were combined, one of ordinary skill would not arrive at the subject matter recited in claims 1 and 14. For example, Chen and Liebmann are both primarily focused on the manipulation of non-printing (i.e., "sub-resolution" or "unresolved") features. Since such features do not print, Chen and Liebmann neither describe nor suggest that a separation distance between the pair of patterning elements be increased while a sufficiently small pitch between corresponding printed features is maintained, as recited in claims 1 and 14.

Moreover, as for Chen's "sixth technique," nothing in Liebmann would lead one of ordinary skill to maintain a sufficiently small pitch between corresponding printed features while a separation distance between a pair of patterning elements is increased, as recited in claims 1 and 14.

Accordingly, claims 1 and 14 are not obvious over Chen and Liebmann. Applicant respectfully requests that the rejections of claims 1, 14, and the claims dependent therefrom, be withdrawn.

CLAIM 10

Claim 10 was rejected under 35 U.S.C. § 102(b) as anticipated by Chen.

Claim 10 relates to a method that includes identifying a pair of features to be printed using a corresponding pair of patterning elements, the pitch of the pair of features being sufficiently small that, upon printing, diffraction will make a separation between the features smaller than a separation between the corresponding pair of patterning elements, and increasing a dimension of at least one of the pair of patterning elements in a direction perpendicular to the sufficiently small pitch.

As an anticipation rejection, the rejection of claim 10 is understood to contend that Chen describes increasing a dimension of at least one of a pair of patterning elements in a direction perpendicular to a pitch that is sufficiently small such that, upon printing, diffraction will make a separation between the features smaller than a separation between the corresponding pair of patterning elements, as recited in claim 10.

Applicant respectfully disagrees. In this regard, As discussed above, Chen's scattering bars are unresolved. Manipulation of their width neither describes nor suggests that a dimension of at least one of a pair of patterning elements is increased in a direction perpendicular to a sufficiently small pitch. In particular, Chen's scattering bars cannot constitute

either "patterning elements" or "printed features," as recited in claim 10.

Moreover, as for Chen's "sixth technique," please note that nothing in this technique describes or suggests a dimension of at least one of a pair of patterning elements is increased in a direction perpendicular to a pitch. Instead, Chen's sixth technique describes that features are adjusted back/trimmed. This clearly does not increase a dimension of a patterning element in a direction perpendicular to a pitch.

Accordingly, claim 10 is not anticipated by Chen. Applicant respectfully requests that the rejections of claim 10, and the claims dependent therefrom, be withdrawn.

Claim 10 was also rejected under 35 U.S.C. § 102(e) as anticipated by Liebmann. As an anticipation rejection, the rejection of claim 10 is understood to contend that Liebmann describes increasing a dimension of at least one of a pair of patterning elements in a direction perpendicular to a pitch that is sufficiently small such that, upon printing, diffraction will make a separation between the features smaller than a separation between the corresponding pair of patterning elements, as recited in claim 10.

Applicant respectfully disagrees. In this regard, as discussed above, Liebmann describes the implementation of sub-resolution assist features (SRAF) that do not print. Liebmann's manipulation of sub-resolution assist features neither describes

nor suggests that a dimension of at least one of a pair of patterning elements is increased in a direction perpendicular to a sufficiently small pitch. In particular, Liebmann's sub-resolution assist features cannot constitute either "patterning elements" or "printed features," as recited in claim 10.

Accordingly, claim 10 is not anticipated by Liebmann. Applicant respectfully requests that the rejections of claim 10, and the claims dependent therefrom, be withdrawn.

Claim 10 was also rejected under 35 U.S.C. § 103(a) as obvious over Chen and Liebmann. As an obviousness rejection, the rejection of claim 10 is based on the contention that the subject matter recited in claim 10 would have been obvious to one of ordinary skill in light of Chen and Liebmann.

Applicant respectfully disagrees and instead submits that, even if Chen and Liebmann were combined, one of ordinary skill would not arrive at the subject matter recited in claim 10. For example, Chen and Liebmann are both primarily focused on the manipulation of non-printing (i.e., "sub-resolution" or "unresolved") features. Since such features do not print, Chen and Liebmann neither describe nor suggest that a dimension of at least one of a pair of patterning elements is increased in a direction perpendicular to a sufficiently small pitch, as recited in claim 10.

Accordingly, claim 10 is not obvious over Chen and Liebmann. Applicant respectfully requests that the rejections of claim 10, and the claims dependent therefrom, be withdrawn.

CLAIM 20

Claim 20 was rejected under 35 U.S.C. § 102(e) as anticipated by Liebmann.

As amended, claim 20 relates to an apparatus that includes a mask operative to image features using radiation having a wavelength. The mask includes an adjacent pair of patterning elements having one or more distorted dimensions to accommodate for diffraction effects due to a size of the patterning elements and a spacing between the patterning elements approaching a diffraction limit of said radiation. The dimensions of the patterning elements are distorted relative to dimensions of the imaged features.

As an anticipation rejection, the rejection of claim 10 is understood to contend that Liebmann describes a mask that includes an adjacent pair of patterning elements having one or more distorted dimensions, as recited in claim 10.

Applicant respectfully disagrees. In this regard, as discussed above, Liebmann describes the implementation of sub-resolution assist features (SRAF) that do not print. Liebmann's sub-resolution assist features thus cannot constitute either

"patterning elements" or "image features," as recited in claim 20.

Accordingly, claim 20 is not anticipated by Liebmann. Applicant respectfully requests that the rejections of claim 20, and the claims dependent therefrom, be withdrawn.

Claim 20 was also rejected under 35 U.S.C. § 103(a) as obvious over Chen and Liebmann. As an obviousness rejection, the rejection of claim 20 is based on the contention that the subject matter recited in claim 20 would have been obvious to one of ordinary skill in light of Chen and Liebmann.

Applicant respectfully disagrees and instead submits that, even if Chen and Liebmann were combined, one of ordinary skill would not arrive at the subject matter recited in claim 20. For example, Chen and Liebmann are both primarily focused on the manipulation of non-printing (i.e., "sub-resolution" or "unresolved") features. Since such features do not print, Chen and Liebmann neither describe nor suggest a mask that includes an adjacent pair of patterning elements having one or more distorted dimensions, as recited in claim 10.

As for Chen's "sixth technique," as discussed above, Chen explicitly states that after a $0.2w$ trimming of the primary feature edges, the feature separation will be $0.4w$ wider. There is no distortion of one or more dimensions of Chen's patterning elements relative to dimensions of the imaged features. Instead, trimming of the primary feature edges is

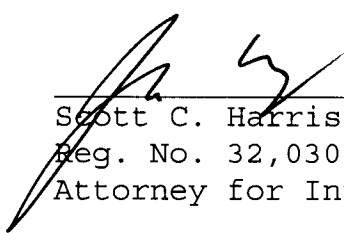
understood to be completely reflected in the separation of the
Chen's imaged features.

Accordingly, claim 20 is not obvious over Chen and
Liebmann. Applicant respectfully requests that the rejections
of claim 20, and the claims dependent therefrom, be withdrawn.

Applicant asks that all claims be allowed. Please apply
the one-month extension of time fee to Deposit Account No. 06-
1050. Please apply any other charges or credits to Deposit
Account No. 06-1050.

Respectfully submitted,

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